Clemson IPM Program Newsletter

April 2021 Issue #1

Integrated pest management is an ecologically-based approach to managing pests with an emphasis on using multiple management strategies. The principles of IPM can be applied to any pest of food or fiber production systems, landscapes, and urban environments. IPM considers multiple control tactics with the aim of minimizing selection pressure on one given tactic.

The Clemson IPM program (https://www.clemson.edu/extension/ipm/index.html) seeks to increase adoption of IPM practices in South Carolina by developing interdisciplinary, research based information, and providing it to the public in efficient and accessible formats. The goals of the IPM program are driven by the needs of stakeholders, who have an integral part in developing the priorities of the current program.

This is the first edition of The Clemson IPM Newsletter which will provide updates on research, extension programs, successes in IPM, important dates, and more!

@IPM_Clemson

Follow the Clemson IPM program on Twitter for real time updates throughout the growing season

Meet the Team

The IPM program at Clemson is comprised of the coordination team, extension personnel, and researchers throughout the state;

Pee Dee REC
Francis Reay-Jones, *Field Crop Entomology*
JC Chong, *Specialty Crop Entomology*
Joe Roberts, *Turfgrass Pathology*

Coastal REC
Tony Keinath, *Vegetable Pathology*
Matt Cutulle, *Vegetable Weeds*
Brian Ward, *Organic Vegetable Specialist*

Edisto REC
Jeremy Greene, *Field Crop Entomology*
Mike Marshall, *Field Crop Weeds*
Dan Anco, *Peanut Specialist*
John Mueller, *Field Crop Pathology*

Clemson Main Campus
Guido Schnabel, *Fruit Crop Pathology*
Juan Carlos Melgar, *Pomology*
Steve Jeffers, *Specialty Crop Pathology*

Baruch Institute
Ben Powell, *Pollinator Specialist*

UGA, Athens
Brett Blaauw, *Peach Entomologist*

Coordination Team
Program Coordinator
Francis Reay-Jones
Associate Program Coordinator
Tim Bryant

Tell us what you think...

Please take a few minutes to fill out this survey to tell us what you would like to see in future editions of this newsletter!

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Thrips Management in Early Season Cotton

Managing an important early season pest of cotton relies heavily on integrated management

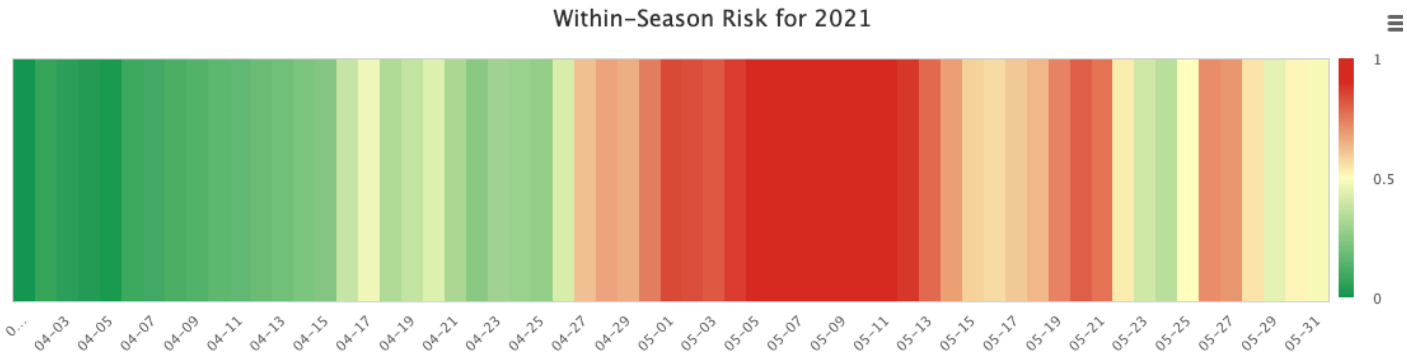
Adult and nymph thrips compared to 12 point font "i"

Thrips injured cotton in untreated row compare to treated cotton

One of the most common pests of cotton early in the season are thrips. Thrips are tiny insects with rasping-sucking mouthparts which feed on plant juices causing injury if enough are present. While chemical control of thrips in cotton has traditionally been an effective strategy, repeated use of seed treatments has come at a cost in the form of insecticide resistance. Dr. Jeremy Greene, at the Clemson University Edisto Research and Education Center, is a field crop entomologist specializing in pest management in cotton and soybeans. "Seed treatments are a very practical delivery system, and control of thrips using this method has been widespread and effective for years. However, over time, this efficient method has come with a price - insecticide resistance. Documented resistance to the commonly used neonicotinoid insecticides has shown that we must consider other forms of control," Dr. Greene says. Due to the declining efficacy of chemical control, Dr. Greene and his colleague, Dr. Francis Reay-Jones, another field crop entomologist, have subsequently been a part of many regional efforts to develop integrated management strategies

Some of the pair's recent research in South Carolina indicated that cotton planting date plays a key role in the risk of thrips infestation and the damage caused to the crop. In this three-year study, they found that the later cotton was planted, the less thrips injury it generally sustained. They also showed that cotton planted in May consistently yielded more than cotton planted earlier (April) or later (June), although this varied from year to year, depending on a number of factors, including weather and variety.

Knowing that planting date can have an impact on thrips infestation and the ability to reliably predict the occurrence of damaging thrips infestations from year to year based on weather patterns and location resulted in the development and refinement of a thrips infestation predictor tool. This online platform allows growers to enter their location and preferred planting date and then provides the associated risk of planting for a surrounding two-week period. Reducing the risk of infestation through alteration of planting date can potentially reduce the need for chemical control of thrips, saving growers time and money.



Thrips infestation risk from the thrips infestation predictor tool from April 3 – May 31.

Planting date is just one important consideration when taking a holistic approach to managing thrips in cotton. For more information on thrips identification, monitoring, damage, and a full range of management check out this recently published Land-Grant Press article (https://lgpress.clemson.edu/publication/best-management-practices-for-thrips-thysanoptera-thripidae-in-cotton/).

Another common issue in cotton later in the season is bollworm (Helicoverpa zea). Modern Bt cotton varieties are genetically modified to produce toxins which can mitigate the effects of bollworm populations on yield, but resistance to some of these traits can be an issue, particularly in areas growing both corn and cotton. "Because almost all of the corn and cotton grown in the Southeast contains genes that produce Bt toxins, many of which are very similar, corn earworm/bollworm goes through intense selection for resistance to these toxins/genes in both crops." Greene says. To preserve the effective traits for as long as possible, Drs. Greene and Reay-Jones stress the importance of growers planting non-Bt corn refuge to prolong the development of resistance in corn earworm (bollworm in cotton) populations. The non-Bt refuge requirement for 2- or 3-toxin Bt corn is 20% of corn acres on a given farm (i.e. 1 bag out 5 bags of seed planted should be non-Bt corn).

Resistance Management in Bt corn

At the Clemson University Pee Dee Research and Education Center, Dr. Francis Reay-Jones is beginning another year of work exploring the efficacy of different Bt traits for corn earworm and fall armyworm, two key pests targeted by Bt corn in South Carolina. Although corn earworm is generally not a significant economic pest of field corn, every corn field in South Carolina will have infestations of this insect, since corn is a preferred plant for the insect. The term Bt corn refers to corn that has been genetically engineered to express one or more insecticidal toxins from Bacillus thuringiensis (Bt). Feeding on the corn plant by the insect leads to insect mortality without needing any additional foliar insecticides. Since the commercialization of Bt corn in 1996, this technology has become widespread and has helped to reduce population of the European corn borer and to manage other pest species, including corn earworm.

The widespread planting of Bt corn in the U.S., including in South Carolina, has led to the development of resistance in corn earworm to some Bt toxins. Reay-Jones conducts trials each year to determine how effective different Bt traits are in corn to manage corn earworm, and whether the efficacy of Bt corn varies over time. "The newer 2- or 3-toxin Bt corn traits that are currently available are more effective than the older single-toxin Bt traits. However, we have seen for several Bt toxins that resistance has developed over time in corn earworm, with increased kernel damage for some products," Reay-Jones said. "Planting a non-Bt refuge is the only tool we have to manage resistance. Preventing resistance development in Bt corn is crucial so that the insect does not cause more damage to Bt cotton later in the season, where the corn earworm (or bollworm) is a major economic pest."

On-going trials at the Pee Dee REC are examining not just injury to corn ears from earworm feeding, but also how many earworms are able to survive in the field after feeding on either Bt or non-Bt corn. "Our studies on the biology of corn earworm can help to detect changes over time in how effective Bt technology is, which then provides information on resistance development", Reay-Jones said. With a limited number of Bt traits available in corn, efforts to delay resistance will help to preserve this valuable technology.

Bt corn trial being planted at Pee Dee REC, Florence, SC

Corn earworm larvae damage to field corn

Promoting Natural Biological Control of Thrips in Strawberry

Flowering cover crop in strawberry could reduce need for chemical management of thrips.

At Boone Hall Plantation in Mt. Pleasant, South Carolina, extension agent Zack Snipes is exploring new options in management mid to late-season infestations of thrips in strawberry.

Thrips are present in strawberries throughout the season and can feed on blooms and, more importantly, directly on fruit, which can reduce the marketability and shelf life of the fruit. "Each year, we see more and more of this damage towards the end of our season. It's hard to estimate the losses from this pest, but I have seen growers lose 10% or more of late-season fruit". Traditionally, thrips are managed in strawberries through chemical applications when an economic threshold is met or on a time-based cycle. Biological control, however, can be very effective in managing thrips population levels.

This year, Snipes is exploring a way to foster biological insect populations by planting rows of flowering cover crops, including clover and brassicas, in between plots of strawberries. The theory is that these flowering plants will help sustain higher populations of biological control agents throughout critical periods of strawberry development and potentially limit thrips populations. "Having blooming plants in the field builds food and shelter for beneficial insects. Having a population of beneficials in the field when there is a major infestation could potentially keep populations of thrips below economic threshold," Snipes said.

For the experiment, four species of clover and one brassica species were planted in drive rows at Boone Hall Plantation. Snipes is studying: when each cover crop species flowers during the strawberry season; what species of beneficials are attracted to the flowers; the tolerance of the cover crop to regular management activity in the field; and percentage of berries with thrips damage. These

Thrips injury to strawberry fruit

will be investigated to see if using blooming cover crops is a realistic and practical option for thrips management.

This strategy would be a meager cost for a grower and could potentially save them a great deal of time and money spent on insecticides if effective. "Thrips are normally managed with neonicotinoids or Spinosad products. These products are broad-spectrum and can have some off-target effects." Snipes said, "These products are also pretty pricey to spray on a per-acre basis when compared to seeding a blooming... (cont. on page 5)

Border and interior rows planted with brassica (left) and clover (right) to promote populations of natural biological control agents at Boone Hall Plantation, SC

cover crop. Relying solely on naturally occurring biological control agents will likely not provide complete thrips control but could be used as another tool in an integrated pest management plan.

This is an excellent example of promoting biological control to reduce damaging populations of a pest preventatively. Ultimately, insecticides may be applied, but this strategy could reduce the number of times thrips reach the economic threshold or delay the population growth. Using all available methods in this way is the cornerstone of successful IPM implementation.

Flathead borer research will benefit the nursery industry in the Carolinas

Flathead borers are pests of various tree species important in fruit, nut and nursery production. Nursery industry representatives, researchers and extension personnel in the South frequently identify flathead borers as one of the top 5 pests of nursery crops. The larvae kill or weaken trees by girdling and cutting off tree sap circulation in the trunk and lower branches, and losses can reach up to 40% in nurseries throughout the country, including in South Carolina.

JC Chong, a professor of entomology at the Pee Dee Research and Education Center, is working with entomologists, horticulturists, plant pathologists, and economists from Universities and USDA throughout the country to develop effective and economical management tools against flathead borers.

The goals of this nationwide research initiative are to develop identification tools, better understand the life history of flathead borers, quantify the impact of these pests, design traps for monitoring and management, and identify effective biological and chemical management strategies in nut and nursery crops. Results from all these studies will help to develop a complete management scheme for flathead borers with consideration for profits and environmental impacts.

A research team led by Dr. Chong has deployed panel traps with different kinds of lures at several commercial nurseries in the Carolinas. The data from these traps will help to identify an effective lure for trapping, identify the most active species in nurseries, determine active time of adults, and develop a degree day model for adult activity. These new monitoring tools will improve the timing of chemical control. In addition to this trapping study, the efficacy of new insecticides has also been investigated. Identifying effective insecticides and their impact on tree health is an important aspect in a full management plan.

Over the next four years, additional activities will be conducted to further develop management strategies and deliver project results and new tools to the nursery industry in the Carolinas. Ultimately, these research and extension activities will lead to increased adoption of IPM strategies in nursery production. This effort is an excellent example of the partnership between Clemson University, nursery industry and USDA, with the end goal of developing management strategies against a major pest.

Top left: Various flathead borer species, Top right: flatehead borer damage to red maple, Bottom: purple flathead borer trap